About Covid-19 Modelling Aotearoa

Covid-19 Modelling Aotearoa modelled Covid-19 and its projected impacts from January 2020 until July 2023. We built a cross-organisation, transdisciplinary, dedicated, and committed group of academic researchers and scientists to help Aotearoa New Zealand face the pandemic.

Our modelling programme was underpinned by Te Tiriti o Waitangi, fast and committed peer review, and ethics. These parameters ensured that our broader team was uniquely equipped to provide scientifically robust results fit for Aotearoa New Zealand, to support public policy and decision-making.

Covid-19 Modelling Aotearoa arose under the leadership of Te Pūnaha Matatini investigators, and was a standalone programme hosted by the University of Auckland from January 2021. Early in the pandemic we were funded by the Ministry of Business, Innovation and Employment, followed by the Department of the Prime Minister and Cabinet, and then Manatū Hauora Ministry of Health.

Management

- Professor Michael Plank, Programme Co-Lead, University of Auckland
- Dr Dion O'Neale, Programme Co-Lead, University of Auckland
- Victoria Louise Smith, Research Manager, University of Auckland
- Kylie Stewart, Communications Manager, Independent
- Matthew Mullin, Research Coordinator, University of Auckland

Compartment-based modelling

Professor Michael Plank, project lead, University of Canterbury

Michael led the development of a number of branching process and compartment-based mathematical models to address the ever-evolving

disease transmission and policy environment in Aotearoa, ensuring that modelling outputs were policy-relevant and timely. In addition, Michael frequently appeared in news media to provide advice, explanation and commentary on COVID-19 for the New Zealand public. Michael is a professor in the School of Mathematics and Statistics at the University of Canterbury.

Dr Rachelle Binny, Manaaki Whenua

Rachelle contributed to the development and running the team's branching process model. She was also responsible for developing and running realtime reproduction number estimates from case data, and led the work that used New Zealand's detailed border testing data to get world-leading estimates of PCR sensitivity through time for SARS-CoV-2. Rachelle now works as a researcher in the wildlife ecology & management group at Manaaki Whenua Landcare Research.

Dr Samik Datta, NIWA

Samik developed pipelines and processes for automating the visualisation and communication of results from the compartment-based models. These approaches streamlined the presentation and interpretation of model outputs and made it easier to investigate larger numbers of scenarios when simulating multiple policy choices. Samik is a group manager for the Population Modelling team at NIWA.

Dr Audrey Lustig, Manaaki Whenua Landcare Research

Audrey led work investigating the potential impact of new variants of SARS-CoV-2 in New Zealand based on emerging international evidence. In addition, she contributed to the development and running of the team's branching process model and border risk assessment model, and co-ordinated the preparation of journal articles and reports.

Dr Oliver Maclaren, University of Auckland

Oliver contributed to the development of compartment-based models and refining model assumptions in light of changes in the situation on the ground. He provided valuable expertise in statistical methods for efficient parameter fitting and uncertainty quantification. This made it possible to better match the output of compartment-based models to changing data for case numbers,hospitalisations and deaths, and to effectively

communicate model uncertainty. Oliver is a lecturer in the Engineering Science Department at the University of Auckland.

Dr Giorgia Vattiato, University of Canterbury

Georgia was responsible for ongoing simulation and development of the compartment-based modelling methods and code. This included ensuring that model parameters accurately reflected the situation on the ground, with an evolving pathogen and a changing transmission environment. Giorgia now works as a quantitative wildlife ecologist at Manaaki Whenua Landcare Research.

Dr Leighton Watson, University of Canterbury

Leighton developed a mathematical approach for estimating trends in Covid-19 infection numbers from wastewater data collected by ESR. This method also made it possible to infer relative changes in the effective reproduction number and in the case ascertainment rate as testing and reporting behaviour changed over time. Leighton is a lecturer in the School of Mathematics and Statistics at the University of Canterbury.

Network- and individual-based modelling

Dr Dion O'Neale, project co-lead, University of Auckland

Dion co-led the network- and individual-based modelling team. Dion was a strong advocate for the importance of considering individual and community heterogeneity when modelling disease and policy impacts. In particular, Dion spearheaded the development of the bipartite Populated Aotearoa Interaction Network (PAIN), in order to be able to simulate of spread of COVID-19 more realistically, and to better address equity implications of mathematical modelling. Dion also regularly responded to journalists to provide advice, explanation and commentary on COVID-19 for the NZ public. Dion is a senior lecturer in the Physics department at the University of Auckland.

Dr Emily Harvey, project co-lead, Market Economics

Emily co-led the network- and individual-based modelling team. In addition to coordinating, supervising, and contributing to the various projects and reports for the team, Emily's contribution also involved developing a number of new mathematical modelling and analysis approaches. Amongst these was a software package for analysis of longitudinal participatory

surveillance data for estimating prevalence of respiratory disease in Aotearoa. Emily is a senior researcher at Market Economics.

Dr James Gilmour, University of Auckland

James was responsible for developing and updating the code for building the Populated Aotearoa Interaction Network (PAIN). He also wrote software for analysing the networks produced by PAIN and the contagion simulation results from CoBiN. James now works as an Actuarial consultant at EY.

Joshua Looker, University of Auckland

Josh developed, maintained, documented, and tested both the PAIN and CoBiN libraries, in addition to parametrising and running contagion simulations. He also led the work on characterising household secondary attack rates. Josh is now studying for a PhD in Applied Mathematics at the University of Warwick.

Dr Gray Manicom, University of Auckland

Gray was responsible for parametrising the effect of vaccination and immunity history in the contagion model, including testing and validation of the CoBiN library. Gray also contributed code for characterising community interactions the PAIN library and investigated the effects of heterogeneous vaccination coverage in the contagion modelling. When last we heard, Gray was driving across southern Africa on a multi-country safari before he moves on to the next step in his career.

Frankie Patten-Elliot, University of Auckland

Frankie's role involved setting up, running and post-processing contagion simulation results in a high-performance computing environment. He was responsible for ensuring that simulation scenarios were appropriately parameterised and that the output was analysed in preparation for reporting insights. Frankie also contributed extensively to the development and testing of the CoBiN library. Frankie is now studying for a PhD in Mathematical Biology at the University of Nottingham

Ella Priest Forsyth, Market Economics

Ella's contributions spanned developing and testing code, managing simulation and analysis pipelines, authoring reports, and presenting results to stakeholders. As part of this, Ella developed new analytic approaches for

processing contagion simulation results and for updating model parameters to fit with an evolving pathogen and an changing environment of transmission control measures. We're hoping that we've convinced Ella that doing a PhD about contagion on networks would be a fulfilling next step in her career.

Joel Trent, University of Auckland

Joel led the development of code for stochastic simulations to quantify the effect of antigen tests for different isolation and quarantine scenarios. This led to the MitigatingIsolationandQuarantine.jl library, the teams only library in the Julia programming language, and probably the best documented. Joel is now a graduate reservoir engineer with Contact Energy.

Dr Steven Turnbull, University of Auckland

Steven was responsible for compiling and analysing the demographic information necessary for building a synthetic population for Aotearoa using the PAIN library. He also developed a number of R Shiny applications for communication and visualisation of data, including vaccination rates and distribution of transmission risk and vulnerability. Steven is now a senior data analyst at Synergia Consulting.

Dr David Wu, University of Auckland

David led the development of the code for stochastic simulations of Contagion on a Bipartite Network — the CoBiN library. He also contributed expertise with software engineering practices, helping to automate and proceduralise the team's work in a high performance computing environment. David is now a post-doc at Monash University in Australia.

Kylie Stewart, Communications Manager

Kylie is a science communicaton specialist based in Kirikiriroa whose previous clients have included The MacDiarmid Institute for Advanced Materials and Nanotechnology and Te Pūnaha Matatini. She acted as media liaison and internal and external communications manager for Covid-19 Modelling Aotearoa.

Epidemiology and Public Health

Professor Trish Priest, University of Otago

Patricia is a New Zealand public health scientist and epidemiologist who is

Professor of Public Health in Medicine at the University of Otago. Throughout the COVID-19 pandemic, she served as an advisor to Covid-19 Modelling Aotearoa, and the New Zealand Ministry of Health.

Distinguished Professor Nigel French, Massey University

Nigel is Distinguished Professor of Infectious Disease Epidemiology and Public Health at Massey University, New Zealand. He is Chief Science Advisor for Te Niwha, the Infectious Diseases Research Platform, Executive Director of the Infectious Disease Research Centre and Emeritus Director of the New Zealand Food Safety Science and Research Centre. Nigel has worked on the epidemiology and control of infectious diseases of national and global importance. He served as an advisor to Covid-19 Modelling Aotearoa.

Mobility Modelling

- Aaron Cutter, Project Lead, Finity
- Jevon Fullbrook, Finity
- Emma Vitz, Finity
- Tyler Dent, Finity

Software automation and code review

- Pieta Brown, Precision Driven Health
- Ning Hua, Precision Driven Health
- Rachel Owens, Precision Driven Health
- Dr Kevin Ross, Precision Driven Health

Peer review

- Associate Professor Matthew Parry, Peer Review Lead, University of Otago
- Distinguished Professor Nigel French, Massey University
- Dr Amanda Kvalsvig, University of Otago
- Associate Professor Markus Luczak-Roesch, Victoria University of Wellington
- Dr Melissa McLeod, University of Otago
- Dr Anja Mizdrak, University of Otago
- Dr Fraser Morgan, Manaaki Whenua – Landcare Research
- Ben Richie, Nicholson Consulting

Covid-19 Modelling Aotearoa would like to acknowledge the contributions of numerous colleagues in previous iterations of the programme since 2020